

Request Request Request Request Request Request Request Request



## PCI-SIG ENGINEERING CHANGE REQUEST

<b>TITLE:</b>	Restructure OCuLink Power Specifications
<b>DATE:</b>	April <del>18</del> <sup>25</sup> , 2017
<b>AFFECTED DOCUMENT:</b>	OCuLink 1.0
<b>SPONSOR:</b>	Jay Neer, Alex Haser - Molex

### Part I

#### 1. Summary of the Functional Changes

The contents of Appendices C and E which address power requirements for the optional external OCuLink cables has been restructured, including their titles, to clarify their contents.

##### 1. Appendix C. External Cable Power Requirements.

- a. Title revised to: Requirements for Optional Peripheral Power in External Cables.
- b. Appendix restructured into 4 sections: Power Source, Hot Plug, Power Sequencing and Power Decoupling plus the Power Requirements Table and the Peak Current Figure.

~~#-C.~~ All content now addresses only the requirements for optional peripheral power in external cables.

Formatted: Bullets and Numbering

##### 2. Appendix E. Active Cable Assemblies

- a. Title revised to: Requirements for Optional Peripheral Active Cable Assemblies.
- b. Appendix restructured in a more orderly fashion for reader usability
- c. All content now addresses only the requirements for optional peripheral active cable assemblies
- d. The paragraph addressing the use of SMBus has been clarified

#### 2. Benefits as a Result of the Changes

The original contents of Appendices C and E appeared to be intertwined which was confusing to the reader. The restructuring makes it clear that they are separate which supports ~~with~~ the intent of the specification.

#### 3. Assessment of the Impact

The ECN provides clarifications for requirements that affect both systems implementers and cable assembly suppliers. The revisions will save time and confusion for the implementation of ~~the~~ optional external OCuLink cables.

#### 4. Analysis of the Hardware Implications

Minimal if any – interest for OCuLink has been internal to date.

Request Request Request Request Request Request Request Request

5. Analysis of the Software Implications

N/A

6. Analysis of the C&I Test Implications

N/A

Part II

Detailed Description of the changeAppendix C and Appendix E

Use this line and style to introduce a specific change in the specification, e.g., “Change Section 1.2, page 97 as follows:”

1.2 Heading of this Section

Insert a quote from the specification here and mark the changes. Use colored strike-outs like this to show deleted sections and use colored underlines like this to show added sections (underlining is important to make the change readable when printed in black and white).

If you added a whole new paragraph, it would look like this. The next sentence would look like this. The next sentence would look like this. The next sentence would look like this. The next sentence would look like this. The next sentence would look like this. The next sentence would look like this. The next sentence would look like this. The next sentence would look like this.

If you deleted a whole paragraph, it would look like this. The next sentence would look like this. The next sentence would look like this. The next sentence would look like this. The next sentence would look like this. The next sentence would look like this. The next sentence would look like this. The next sentence would look like this.

Introduce the next change here.

Insert a quote from the specification here and mark the changes. Use revision marks to show delete sections and added sections, like this example.

Table 2-4: A Table that Must Be Changed

Columns	Columns	Columns
Table stuff	Table stuff	Table stuff
Table stuff	Table stuff	Table edit stuff
Table stuff	Table stuff	Table stuff
Table stuff	Table stuff	Table stuff
Table stuff	Table stuff	Table stuff

Formatted: Normal

Formatted: Font color: Text 1

Formatted: Font color: Text 1

**Request Request Request Request Request Request Request Request**

*Introduce the next change here.*

~~Insert a quote from the specification here and mark the changes. Use revision marks to show delete sections and added sections, like this example.~~

~~Insert a copy of the old figure here and strike it out.~~

~~Insert the changed figure here.~~

**~~Figure 5-1: A Figure that Must Be Changed~~**

# Appendix C – External Cable Power Requirements for Optional Peripheral Power in External Cables

The requirements when implemented are:

## C.1. Power Source

- Optional Peripheral Power shall only come from the root only supports up to 10 W MAX on each of the ~~two 5 V pins~~ defined totaling 10 W MAX.
- Root devices that provide optional peripheral power are responsible for preventing reverse current flow.
- In a tethered configuration where peripheral 5 V power is supplied by the Root, the V<sub>act</sub> generated at the end point is included in the root 10 W total budget. Refer to Appendix E for V<sub>act</sub> power requirements.
- ~~All OCuLink enclosures must support V<sub>act</sub> (1.5 W Max per defined pins).~~
  - ~~V<sub>act</sub> must be provisioned per connector end.~~  
~~(i.e., V<sub>act</sub> is not carried through the cable from the root to the end point).~~
  - ~~V<sub>act</sub> must remain “on” in all power management states.~~
  - ~~Required to support cable management services.~~

~~To avoid exceeding system power supply limits and cooling capacity, all cables at power up, by default, must operate with ≤1.5 W. The maximum power level is allowed to exceed the classified power level for 500 ms, following hot insertion or power up. However, the current is limited to values given by Table C-1 and illustrated in Figure C-1.~~

~~At host power up the host must supply 3.3 V<sub>act</sub> TX and 3.3 V<sub>act</sub> RX to the cables within 100 ms of each other.~~

~~Table C-1-1 is swept from 10 Hz to 10 MHz, according to the methods of C.3.3. This emulates the worst case noise of the host.~~

~~It is also desirable for a cable and host to each tolerate a degree of random or semi-random noise on both 3.3 V<sub>act</sub> TX and 3.3 V<sub>act</sub> RX, simultaneously, but the characteristics of this noise are beyond the scope of this document.~~

## C.2. Hot Plug/Removal (Surprise insertion/Removable)

- The External OCuLink systems interface must detect cable presence prior to enabling any cable function including power from the connected cable.

Formatted: Font: (Default) Arial, 19 pt, Bold

Formatted: Subscript

Formatted: Font: Arial, 19 pt

## Request Request Request Request Request Request Request Request

- ☐ The system is responsible for safe-guarding against transient power such that it does not damage electrical components at either end.
- ☐ Refer to Table X for connector contact power ratings

### C.3. Power Sequencing

There is no specific requirement for power supply sequencing of each of the two power supply rails. They are permitted to come up or go down in any order. The system, however, must assert the PERST# signal whenever either of the two power rails go outside of the specifications.

Formatted: Font: Arial, 19 pt

### C.4. Power Decoupling

Due to the low level signaling of the PCI Express interface, it is strongly recommended that sufficient decoupling of all power supplies be provided. This is recommended to ensure that power supply noise does not interfere with the recovery of data from a remote Upstream PCI Express device.

Formatted: Font: Arial, 19 pt

- ☐ The External OCuLink interface must be designed to meet applicable safety standards. Usually, this means that a powered connection implements current limiting on any devices connected to the interface. Two examples are:
  - ☐ Active cables
  - ☐ Power delivery to endpoint ports.

Request Request Request Request Request Request Request Request

Table C-1. OCuLink Cable Assembly Per Contact V<sub>act</sub> Power Requirements

Formatted: Subscript

Parameters	Symbol	Conditions	Min	Max	Units
Power supply noise tolerance including ripple [peak-to-peak] <u>10 Hz-100 MHz</u>				66	mV
Power supply voltages including ripple, droop and noise below 100 kHz	3.3 V <sub>act</sub> TX 3.3 V <sub>act</sub> RX	Note 1	3.14	3.46	V
Instantaneous peak <u>charge</u> current at Hot-Plug <u>and Initialization</u>		Note 2, 3		<u>400</u> <u>650</u>	mA
Sustained peak current at Hot-Plug <u>and Initialization</u>		Note 2, 3, 5		<u>330</u> <u>500</u>	mA
<u>Instantaneous peak current on enabling</u>	-	<u>Note 2, 3, 5</u>	-	<u>600</u>	<u>mA</u>
<u>Sustained peak current on enabling</u>	-	<u>Note 2, 3, 5</u>	-	<u>500</u>	<u>mA</u>
Maximum power consumption <u>at power-up</u>		Note 4		<u>1.6</u> <u>5</u>	W
Maximum power consumption <u>a</u> <u>fter</u> power up		Note 4		1.5	W

Formatted Table

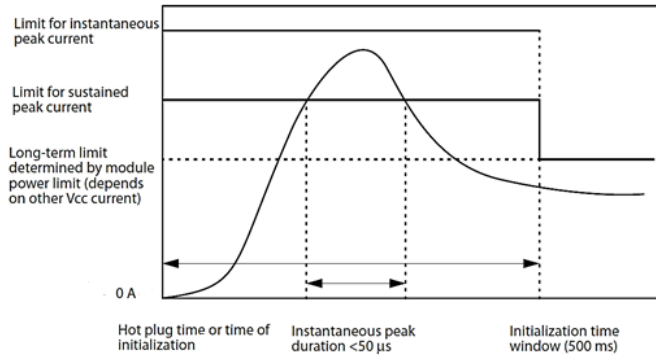
Notes:

1. Set point is measured at the input to the connector on the host board reference to ground.  
Droop is any temporary drop in voltage of the power supply, such as that caused by plugging in another cable assembly or when enabling another cable assembly.
2. The requirements for current apply to the current through each inductor.
- ~~3. The maximum currents are the allowed currents for each power supply; therefore, the total module peak currents are permitted to be twice this value. The instantaneous peak current is allowed to exceed the specified maximum current capacity of the connector contact for a short period, see Figure C-1.~~
- ~~4.3.~~ Maximum cable assembly power consumption must not exceed 1.5 W from 500 ms after power up.
- ~~4.~~ Not to exceed the instantaneous sustained peak limit for more than 50 ~~us~~; ~~but is permitted to exceed this limit for shorter durations.~~
- ~~5.~~ Free side must limit currecnt to 500mA upon initialization/ enablement.
- ~~5-6.~~ Refer to Figure C-1 for typical curves.

Formatted: Font: 9 pt

Formatted: Font: 9 pt

Request Request Request Request Request Request Request Request



**Figure C-1. Instantaneous and Sustained Peak Current for 3.3 V<sub>act</sub> TX and 3.3 V<sub>act</sub> RX**

## C.1. Power Sequencing

There is no specific requirement for power supply sequencing of each of the two power supply rails. They are permitted to come up or go down in any order. The system, however, must assert the PERST# signal whenever either of the two power rails go outside of the specifications.

## C.2. Power Decoupling

Due to the low level signaling of the PCI Express interface, it is strongly recommended that sufficient decoupling of all power supplies be provided. This is recommended to ensure that power supply noise does not interfere with the recovery of data from a remote Upstream PCI Express device.

# Appendix E – Requirements for Optional Peripheral Active Cable Assemblies

- ☐ External Host Board-side Cable interfaces intended to operate at PCIe Gen 3 (8.0 GT/s) must be designed to support both passive and active cables
- ☐ All OcuLink enclosures must support V<sub>act</sub> (1.5 W Max per defined pins).
- ☐ Active cables require both the Root and Endpoint to provide 3.3 V to their respective cable plugs. 3.3 V does not go down the cable therefore, V<sub>act</sub> must be provisioned per connector end.



## Request Request Request Request Request Request Request Request

- ☐ At host power up, the host must supply 3.3 V<sub>act</sub> TX and 3.3 V<sub>act</sub> RX to the cables within 100 ms of each other.
- ☐ V<sub>act</sub> must remain “on” in all power management states.
- ☐ V<sub>act</sub> Required to support cable management services.
- ☐ Active cables must contain memory.
- ☐ Each manufacturer of active cables is responsible for:
  - ☐ Creating and storing data in a method consistent with Appendix A and Appendix B.
  - ☐ Ensuring that the Link is able to operate when using the eye diagrams defined in *PCI Express Base Specification*, and other *PCI Express Specifications* listed in Section 1.1 Reference Documents.
- ☐ Active cable behavior must take into account Link training protocol specified in the *PCI Express Base Specification*, and be able to accept the potential changes from the Subsystem Transmitters during Link training at 8.0 GT/s.
- ☐ Active cables must initially operate at 2.5 GT/s in order to ensure initial Link training and then operate at the highest Link speed supported.
- ☐ Active cables must transparently support Electrical Idle and Receiver Detect.
- ☐ Active cables to support arbitrarily long cable lengths as constrained by the active component power budget and PCI Express clocking schemes in specific applications.
- ☐ Active cables to be visible to enclosure software as required for identification and management purposes. The use of SMBus across the cable is an optional feature.
  - ☐ The SMBus/ 2-Wire interface employed in this specification can be either a Passive or Active implementation. The Passive solution may provide a 2-Wire connection from the root to the endpoint to determine its usage or for device management.
  - ☐ Due to complexity, Active Optical Cables may not want to implement this option and are therefore permitted to have a reduced feature set. Requirements for PCI Express cables with reduced feature sets are described in SFF-8449.
  - ☐ It is the system implementer’s responsibility to meet the electrical Specifications for the SMBus, when used across the cable.
- ☐ The External OCuLink interface must be designed to meet applicable safety standards including the implementation of current limiting on any devices connected to the interface. Two examples are:
  - ☐ Active cables
  - ☐ Power delivery to Endpoint ports.

Formatted: SIG\_Bullet 2